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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,308	06/23/2006	Harue Nakashima	0756-7725	8956
31780 7590 03/29/2011 Robinson Intellectual Property Law Office, P.C. 3975 Fair Ridge Drive Suite 20 North Fairfax, VA 22033				
EXAMINER				
YANG, JAY				
ART UNIT		PAPER NUMBER		
1786				
MAIL DATE		DELIVERY MODE		
03/29/2011		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/584,308

**Applicant(s)**

NAKASHIMA ET AL.

**Examiner**

J. L. YANG

**Art Unit**

1786

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 January 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsman's Patent Drawing Review (PTO-940)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/21/11 has been entered.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

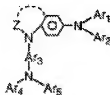
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

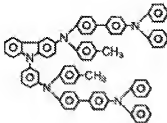
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-5, 7-11, 13-17, 19-23, and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1) and Matsumoto et al. (US 2005/0098207 A1).

Regarding Claims 1-5 and 25-27, Kitahora et al. discloses a light-emitting element comprising an anode, hole-transporting layer, light-emitting layer, electron-transporting layer, and a cathode ([0078]). Kitahora et al. discloses an oxadiazole compound (that has electron-donating properties) to be in the electron-transporting layer and aluminum tris oxine as the light-emitting substance in the light-emitting layer ([0133]). Kitahora et al. discloses that such light-emitting elements are applicable to various kinds of display devices ([0105]). Kitahora et al. discloses an amino compound represented by the following general formula to be in the hole-transporting layer ([0078]):



((I), page 2) where Z = forms a ring with the nitrogen and benzene ring (but does not explicitly say it cannot be substituted). Kitahora et al. discloses a wide variety of such compounds including:



((1), page 14) such that  $R^1$  = aryl group having 18 carbon atoms. Kitahora et al. discloses the hole-injecting properties of such carbazole derivatives ([0136]). However, Kitahora et al. does not explicitly disclose a carbazole derivative in which  $R^1$  meets the limitations as claimed by the Applicant. Kitahora et al. further does not explicitly disclose an inorganic compound to be in the hole-transporting/injecting layer with the carbazole derivative nor a fourth layer that contains the carbazole derivative and an inorganic compound. Regarding the former disclosure, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Compound 19 as shown above such that of  $R^1$  = (-phenyl)N(phenyl)<sub>2</sub>. The motivation is provided by the fact that the general formula as disclosed by Kitahora et al. clearly allows for such an assignment, in addition to the fact that such a substituent at that particular position is known as exemplified by Compound 1, rendering the modification predictable with a reasonable expectation of success.

Aoki et al. discloses the use of vanadium oxide can be used to improve hole-injecting properties of a hole-injecting layer in an organic EL device ([0095]). It would have been obvious to one of ordinary skill in the art at the time of the invention to add vanadium oxide as disclosed by Aoki et al. to the hole-transporting/injecting layer of the light-emitting element that contains the carbazole derivative as disclosed by Kitahora et al. The motivation would be that the vanadium oxide will improve light emission properties and efficiencies due to its ability to improve hole injection into the light-emitting layer.

Matsumoto et al. discloses a charge-generating layer (16) to be directly adjacent to the cathode (Fig. 1). Matsumoto et al. discloses the composition of the charge-generating layer: an electron-donating (hole-transporting) compound such as an arylamine compound and vanadium oxide ([0158]). The arylamine compound is represented by the following formula:



([0159]) where Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub> each independently represent an aromatic hydrocarbon group which may have substituents. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate this charge-generating layer adjacent to the cathode as disclosed by Matsumoto et al. to the light-emitting element as disclosed by Kitahora et al in view of Aoki et al. The motivation would be that such a layer would increase light emission properties and efficiencies due to its ability to inject holes and electrons into the cathode and anode, respectively. In addition, it would be

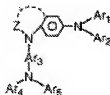
further obvious to substitute the carbazole derivative as disclosed by Kitahora et al. for the arylamine compound as disclosed by Matsumoto et al. in the charge-generating layer. The motivation would be that the carbazole derivative is also an arylamine compound that has high electron-donating (hole-transporting) properties.

Regarding Claims 7-11 and 13-17, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute a phenyl for a biphenyl in the carbazole derivative in the organic EL device as disclosed by Kitahora et al. in view of Aoki et al. and Matsumoto et al. to produce the carbazole derivatives as recited in the claims. The motivation is provided by the fact that such a substitution would result in a homologous compound with similar physical and chemical properties resulting from the substitution of a biphenyl group for an obvious variant (phenyl). Moreover, Kitahora et al. allows a phenyl group (for Ar<sub>2</sub>, (1), [0034]) for the other substituent of the amino group.

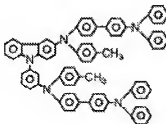
Regarding Claims 19-23, Kitahora et al. allows a naphthyl group (for Ar<sub>2</sub>, (36), [0041]) for one of the other substituent of the amino group.

4. Claims 1-4, 6-10, 12-16, 18-22, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1).

Regarding Claims 1-3, 6-9, 12-15, 18-21, and 24-27, Kitahora et al. discloses a light-emitting element comprising an anode, hole-transporting layer, light-emitting layer, electron-transporting layer, and a cathode ([0078]). Kitahora et al. discloses an oxadiazole compound (that has electron-donating properties) to be in the electron-transporting layer and aluminum tris oxine as the light-emitting substance in the light-emitting layer ([0133]). Kitahora et al. discloses that such light-emitting elements are applicable to various kinds of display devices ([0105]). Kitahora et al. discloses an amino compound represented by the following general formula to be in the hole-transporting layer ([0078]):



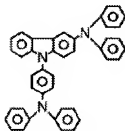
((I), page 2) where Z = forms a ring with the nitrogen and benzene ring (but does not explicitly say it cannot be substituted). Kitahora et al. discloses a wide variety of such compounds including:



((19), page 7) such R<sup>2</sup> = hydrogen, Ar<sup>1</sup> = aryl group having 7 carbon atoms (substituted phenyl group), Ar<sup>2</sup> = Ar<sup>3</sup> = aryl group having 6 carbon atoms, and X = bivalent aromatic

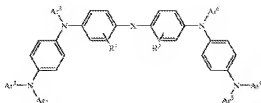


hydrocarbon group having 12 carbon atoms (biphenyl group) of Formula (1) as defined by the Applicant and

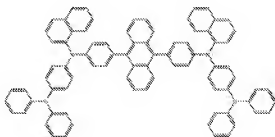


((1), page 14) such that  $R^1$  = aryl group having 18 carbon atoms. Kitahora et al. discloses the hole-injecting properties of such carbazole derivatives ([0136]). However, Kitahora et al. does not explicitly disclose a carbazole derivative in which  $R^1$  meets the limitations as claimed by the Applicant. Kitahora et al. further does not explicitly disclose an inorganic compound to be in the hole-transporting/injecting layer with the carbazole derivative, a fourth layer that contains the carbazole derivative and an inorganic compound, nor explicitly a carbazole derivative in which  $R^2$  = substituted amino group. Regarding the former disclosure, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Compound 19 as shown above such that  $R^1$  =  $(\text{-phenyl})\text{N}(\text{phenyl})_2$ . The motivation is provided by the fact that the general formula as disclosed by Kitahora et al. clearly allows for such an assignment, in addition to the fact that such a substituent at that particular position is known as exemplified by Compound 1, rendering the modification predictable with a reasonable expectation of success.

Kawamura et al. discloses the following compound capable of hole-transport represented by:



(General formula (1), col. 2). Kawamura et al. discloses a particular example:



(PD-02, col. 7) where the amino substituent attached to the anthracene derivative satisfies structural formula (104). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the 9,10-diphenyl anthracene in the derivative as disclosed by Kawamura et al. for a carbazole group to meet the limitations of the Applicant's claims. The motivation would be the fact that  $X$  = single bond (col. 4, line 53) and  $R^7$  and  $R^8$  = form a 5-membered ring (col. 4, line 61), in addition to the fact that Kawamura et al. already discloses nitrogen-containing aromatics for  $X$  (PD-50, col. 33) and that carbazole groups as disclosed by Kitahora et al. are known in the art.

It would have been further obvious to one of ordinary skill in the art at the time of the invention to substitute the above carbazole as disclosed by Kitahora et al. in view of Kawamura et al. for the carbazole derivative in the organic EL device as disclosed by Kitahora et al. The motivation lies in the fact that both are analogous carbazole

derivatives with known hole-transporting functions for use in organic EL devices such that the substitution would have been predictable with a reasonable expectation of success.

Aoki et al. discloses the use of vanadium oxide can be used to improve hole-injecting properties of a hole-injecting layer in an organic EL device ([0095]). It would have been obvious to one of ordinary skill in the art at the time of the invention to add vanadium oxide as disclosed by Aoki et al. to the hole-transporting/injecting layer of the light-emitting element that contains the carbazole derivative as disclosed by Kitahora et al. in view of Kawamura et al. The motivation would be that the vanadium oxide will improve light emission properties and efficiencies due to its ability to improve hole injection into the light-emitting layer.

Matsumoto et al. discloses a charge-generating layer (16) to be directly adjacent to the cathode (Fig. 1). Matsumoto et al. discloses the composition of the charge-generating layer: an electron-donating (hole-transporting) compound such as an arylamine compound and vanadium oxide ([0158]). The arylamine compound is represented by the following formula:



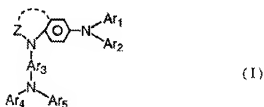
([0159]) where Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub> each independently represent an aromatic hydrocarbon group which may have substituents. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate this charge-generating layer adjacent to the cathode as disclosed by Matsumoto et al. to the light-emitting element

as disclosed by Kitahora et al. in view of Kawamura et al. and Aoki et al. The motivation would be that such a layer would increase light emission properties and efficiencies due to its ability to inject holes and electrons into the cathode and anode, respectively. In addition, it would be further obvious to substitute the carbazole derivative as disclosed by Kitahora et al. in view of Kawamura et al. for the arylamine compound as disclosed by Matsumoto et al. in the charge-generating layer. The motivation would be that the carbazole derivative is also an arylamine compound that has high electron-donating (hole-transporting) properties.

Regarding Claims 4, 10, 15, and 22, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the carbazole derivative in the organic EL device as disclosed by Kitahora et al. (JP 1998-310574 A) in view of Aoki et al. (US 2001/0022497 A1), Matsumoto et al. (US 2005/0098207 A1), and Kawamura et al. (US 541,129 B1) such that the carbazole nitrogen is substituted by a methyl group instead of hydrogen. The motivation is provided by the fact that Kawamura et al. discloses that X = substituted 5-member ring (col. 2, lines 35-36) in addition to the fact that a hydrogen to methyl modification is an obvious variation producing a compound with similar chemical and physical properties to make it predictable with a reasonable expectation of success.

***Response to Arguments***

1. The Applicant disagrees on page 3 with the assertion that  $R^1$  of Formula (1) as defined by the Applicant only potentially teaches that it has 37 carbon atoms. As explained in the above rejection, it is the position of the Examiner that there is sufficient motivation to modify Compound 19 as disclosed by Kitahora et al. such that  $R^1$  meets the limitations as claimed by the Applicant (i.e.,  $R^1$  = aryl group with 18 carbon atoms). The motivation is clearly provided by the fact that the invention of Kitahora et al. is not explicitly limited to the possible embodiments of the general formula (Formula (I)) shown below:



where Ar3-Ar5 can be aryl groups, the most obvious of which are phenyl groups as exemplified by Compound 1.

2. The Applicant argues that the resulting combination (in which Ar3-Ar5 = phenyl) must still have  $R^2$  = substituted amino group corresponding to Formula (2) as defined by the Applicant. However, the Applicant ignores the disclosure of Kawamura et al. as described above which also discloses a hole-transporting derivative such that in combination with the teaching of Kitahora et al., one of ordinary skill in the art can reasonably and predictably produce the carbazole derivatives with  $R^2$  = substituted amino group as claimed by the Applicant.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. YANG whose telephone number is (571)270-1137. The examiner can normally be reached on Monday to Thursday from 8:30 am to 6:00 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A Chriss/  
Supervisory Patent Examiner, Art Unit 1786

/J. Y./  
Examiner, Art Unit 1786